$CuO + H_2 \rightarrow Cu + H_2O$

1. How many grams of hydrogen are needed to react with 500g of copper(II) oxide?

$$500g\ CuO \times \frac{1mol}{79.5g} \times \frac{1mol\ H_2}{1mol\ CuO} \times \frac{2g\ H_2}{1\ mol} = 12.6g\ H_2$$

2. What is the limiting reagent if 23g of CuO reacts with 1.2g of H_2?

$$\underset{\text{given}}{23g\ CuO} \times \frac{1\ mol}{79.5g} \times \frac{1mol\ H_2}{1mol\ CuO} \times \frac{2g\ H_2}{1mol} = \underset{\text{needed}}{0.59g\ H_2}$$

1.2g H_2 CuO is the limiting reagent.

$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$

1. How many moles of sugar are required to react with 5 moles of O_2?

$$5\text{mol } O_2 \times \frac{1\text{mol } C_6H_{12}O_6}{6\text{ mol } O_2} = 0.83\text{mol } C_6H_{12}O_6$$

2. What is the limiting reagent if 100g sugar reacts with 180g O_2?

$$100\text{g } C_6H_{12}O_6 \times \frac{1\text{mol}}{180\text{g}} \times \frac{6\text{mol } O_2}{1\text{mol } C_6H_{12}O_6} \times \frac{32\text{g}}{1\text{mol}} = 106.7\text{g } O_2$$

given needed

180g O_2 $C_6H_{12}O_6$ is the limiting reagent.

$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$

3. How many grams of water are produced when 75g of sugar reacts with 75g oxygen?

$$75g\ C_6H_{12}O_6 \times \frac{1mol}{180g} \times \frac{6mol\ O_2}{1mol\ C_6H_{12}O_6} \times \frac{32g}{1mol} = 80g\ O_2$$

given needed

75 g O_2 O_2 is limiting reagent.

$$75g\ O_2 \times \frac{1mol}{32g} \times \frac{6mol\ H_2O}{6mol\ O_2} \times \frac{18g}{1mol} = 42.2g\ H_2O$$

= theoretical yield.

In the lab, I produced 37.1g H_2O. What is my percent yield?

experimental yield = 37.1g

theoretical yield = 42.2g

$$\text{percent yield} = \frac{37.1}{42.2} \times 100 = 87.9\%$$

$N_2 + 3F_2 \rightarrow 2NF_3$

5. How many grams of nitrogen trifluoride are produced when 210g fluorine reacts with 58g nitrogen?

$$58g\ N_2 \times \frac{1mol}{28g} \times \frac{3mol\ F_2}{1mol\ N_2} \times \frac{38g}{1mol} = 236.1g\ F_2$$

given — needed

210g F_2 — F_2 is limiting reagent.

$$210g\ F_2 \times \frac{1mol}{38g} \times \frac{2mol\ NF_3}{3mol\ F_2} \times \frac{71g}{1mol} = 261.6\ g\ NF_3$$

= theoretical yield.

In the lab, 179.8g of NF_3 are produced. What is the percent yield?

experimental yield = 179.8g

theoretical yield = 261.6g

$$\text{percent yield} = \frac{179.8\text{g}}{261.6\text{g}} \times 100 = 68.7\%$$